# AS LIGHT OF YOUR FOOTSTEPS

## Investigating individual differences in the perception of own-body weight through auditory illusions

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## Introduction

**People's body perceptions are highly malleable,** as demonstrated by neuroscientific studies on sensory-driven illusions[1].

- Sounds in combination with tactile and/or proprioceptive cues, can change people's body perceptions, as seen in the footsteps illusion[2].
- There are **individual differences** in the effects, e.g. according to body ideals[3] or symptomatology of eating disorders[4]
- We aimed to replicate and extend the previous findings by using an improved setup, including a highly portable digital audio system, a full-body motion capture suit, and physiological sensors.

**Investigating individual differences in the effects of the footsteps illusion**

## Our system[2,5]

-**Binaural microphones** capture the footstep sounds.

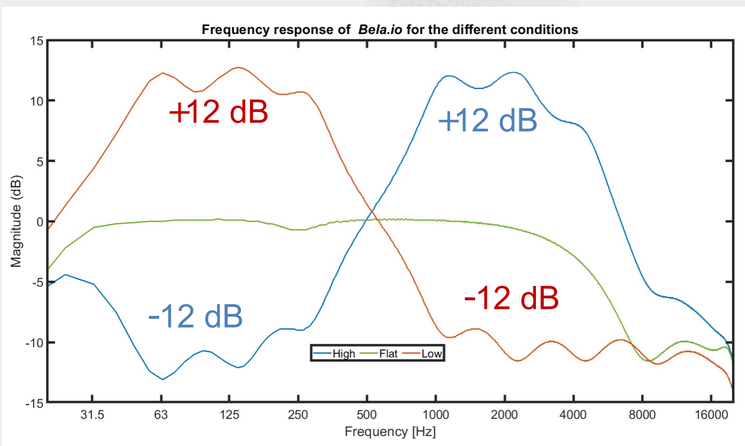
-**Bela.io** device for real-time sound processing.

## 3 Sound Conditions:

-**High Frequency**: (83–250 Hz) -12dB, (1–4 kHz) +12 dB

-**Low Frequency**: (83–250 Hz) +12 dB, (1–4 kHz) -12 dB

-**Control**: no modification of frequency spectra

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## What is the footsteps illusion?[2]

**Dynamic modification of footstep sounds** can lead people to:

-Perceive their body as thinner/lighter

-Walk more dynamically

-Feel happier

## How do we measure this illusion?

-**Body visualizer**[6]

-Body behavior: **IMUs** (gait)

-**Physiological sensors**

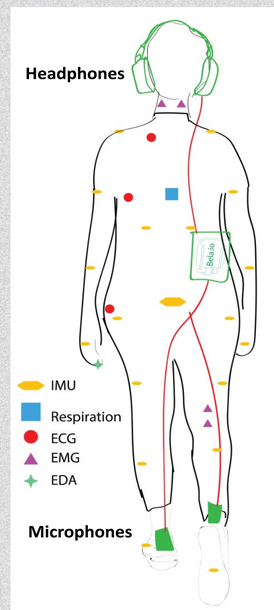
  -EMG

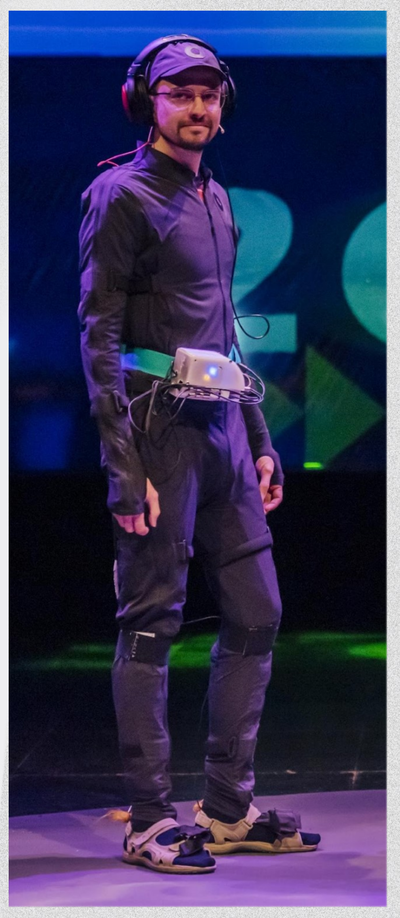
  -ECG

  -EDA

  -Respiration

-**Self reports**



## Which individual differences?

-**Body concerns**

-**Eating disorder symptomatology**[4]

-**Levels of physical activity**

-**Sensory imagery**

-**Social support networks**

-**Body ideals related to gender**[3]

## Screening Questionnaires:

-Multidimensional Body Self Relations Questionnaire (MBSRQ)[7]

-Eating Disorder Examination Questionnaire (EDEQ)[8]

-International Questionnaire of Physical Activity (IPAQ)[9]

-Betts' Questionnaire Upon Mental Imagery[10]

-Social Support Networks Questionnaire[11]

### Data from General and Subclinical Population

Participants screened: N= 178 Participants selected: **N = 104**:
According to level of physical activity (PA) and symptomatology eating disorder (SED)

-LOW PA, LOW SED (M: EDEQ < 1.08, F: EDEQ < 1.90) : **26**

-LOW PA, HIGH SED (M: EDEQ ≥ 1.08, F: EDEQ ≥ 1.90) : **18**

-HIGH PA, LOW SED (M: EDEQ < 1.08, F: EDEQ < 1.90) : **38**

-HIGH PA, HIGH SED (M: EDEQ ≥ 1.08, F: EDEQ ≥ 1.90) : **21**

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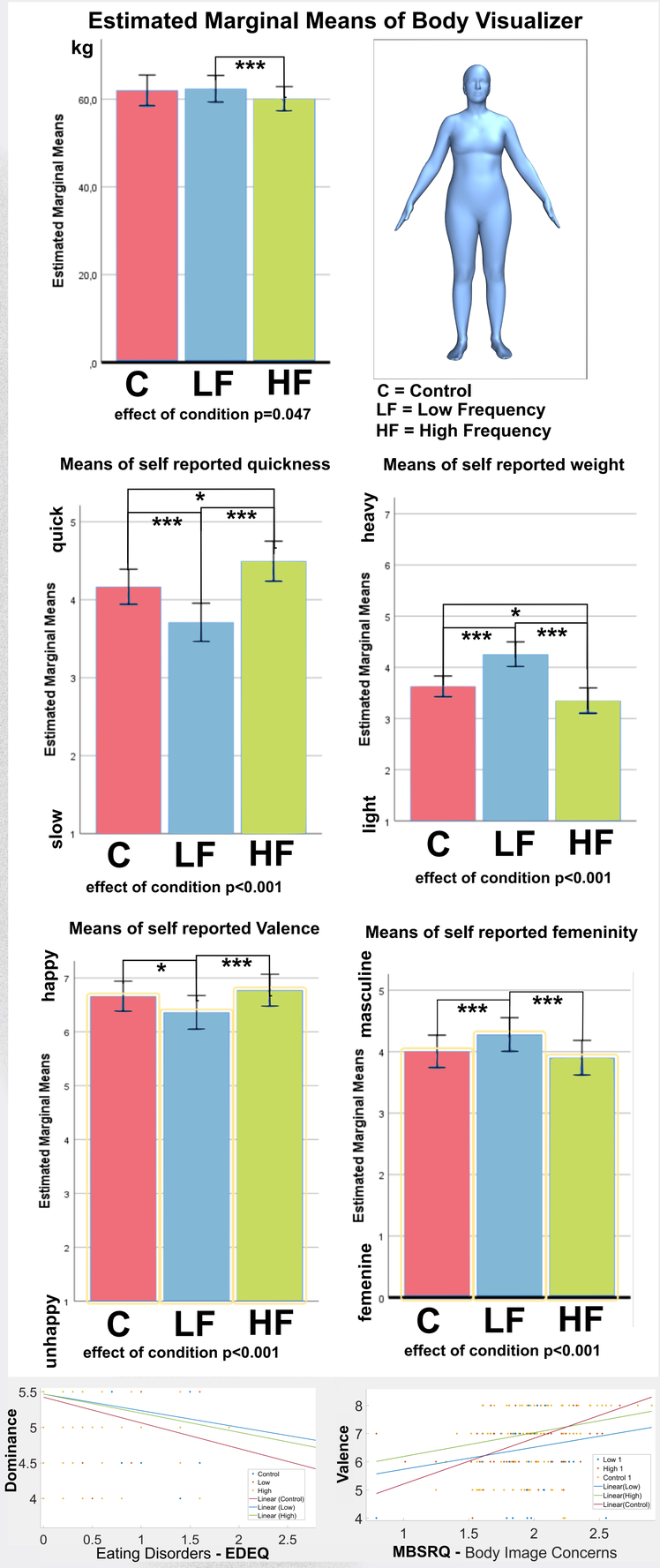
## Effects on body perception







Our preliminary results replicate the overall effect of sound condition in perceived body weight. With high frequency sound participants visualized their body as **slimmer**, and self-report feeling **lighter**, **quicker**, and **happier**.

The effects on emotional **valence** differ to individuals body concerns, while **dominance** is influenced by symptomatology of eating disorders.

The created database will also allow to understand the relationship between sound, body perception, behavior and emotion through the implementation of ML algorithms.

**Our research also opens opportunities for designing novel systems and therapies for people with negative body perceptions and to support physical activity.**

References:

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